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THE OPTICAL PROPERTIES OF THIN GERMANIUM
FILMS

Paul Michael Grant

June 1965

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Paul Michael Grant

June, 1965

Technical Report No. HP-14

Gordon McKay Laboratory
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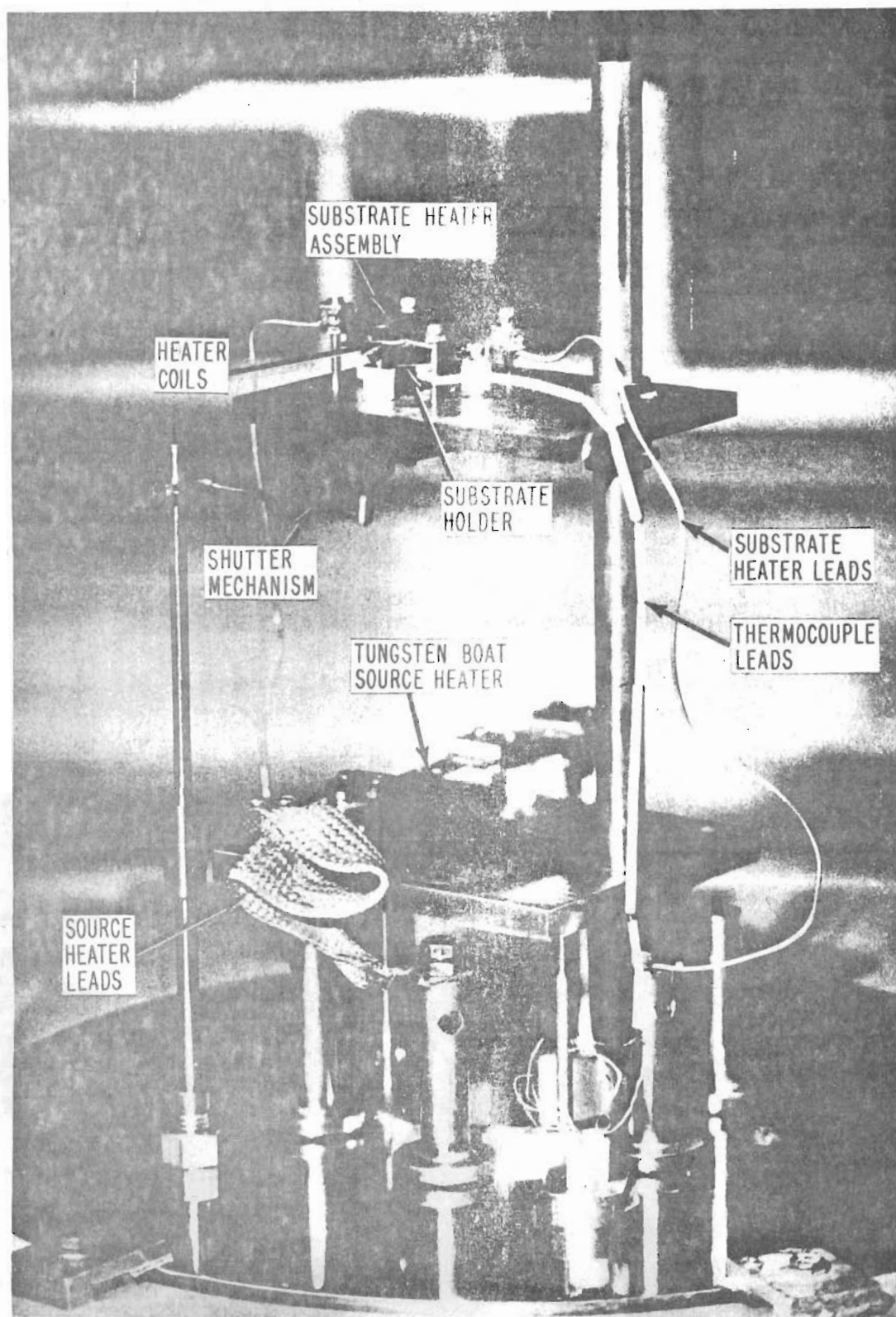


FIG. 2-2 THE HARVARD EVAPORATION APPARATUS

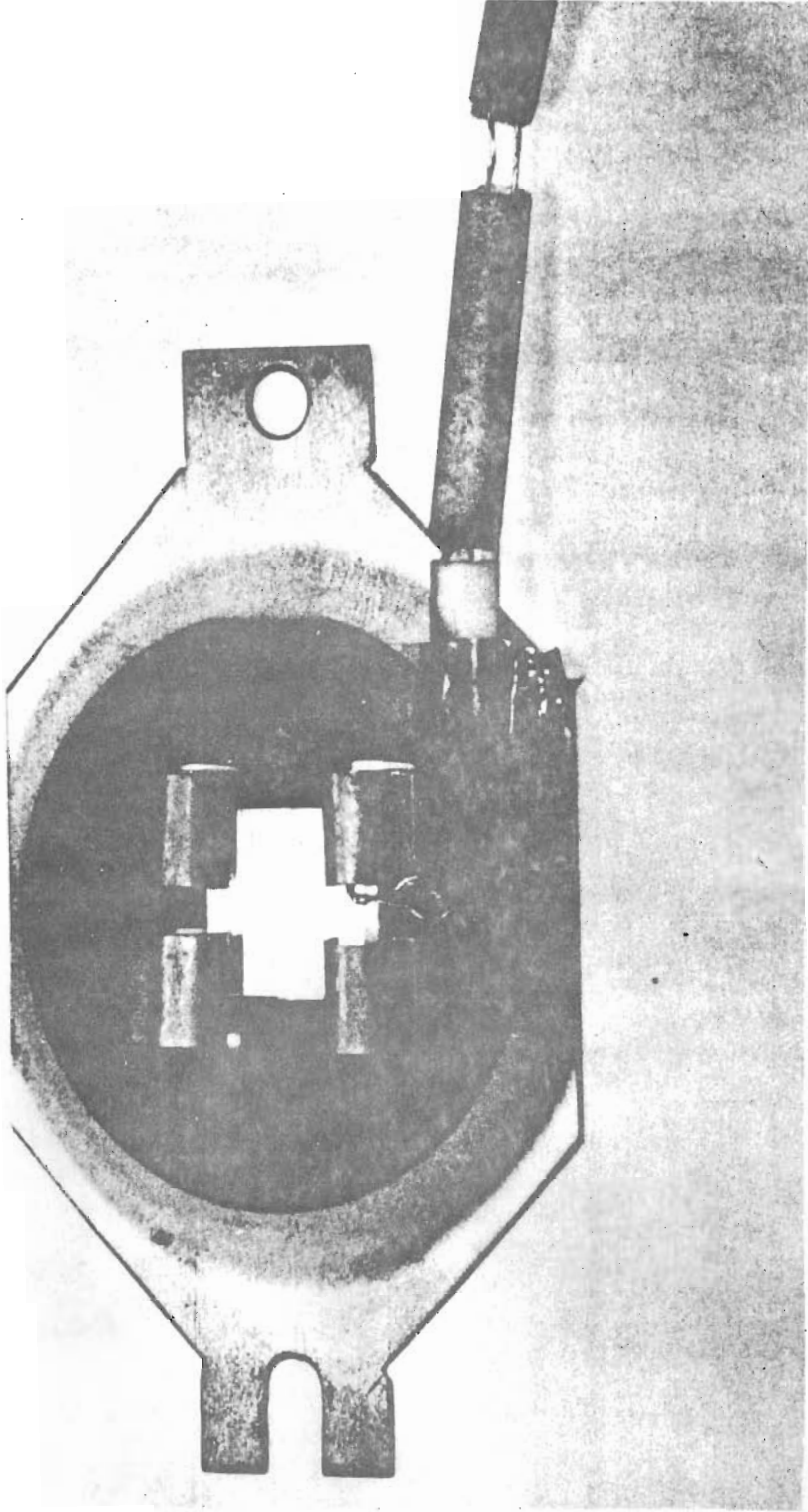
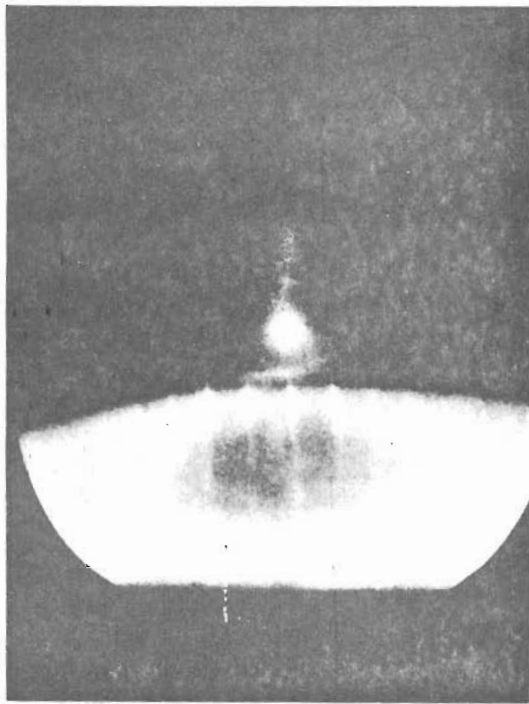


FIG. 2-3 DETAILS OF THE SUBSTRATE HOLDER SHOWING SUBSTRATE AND THERMOCOUPLE IN POSITION

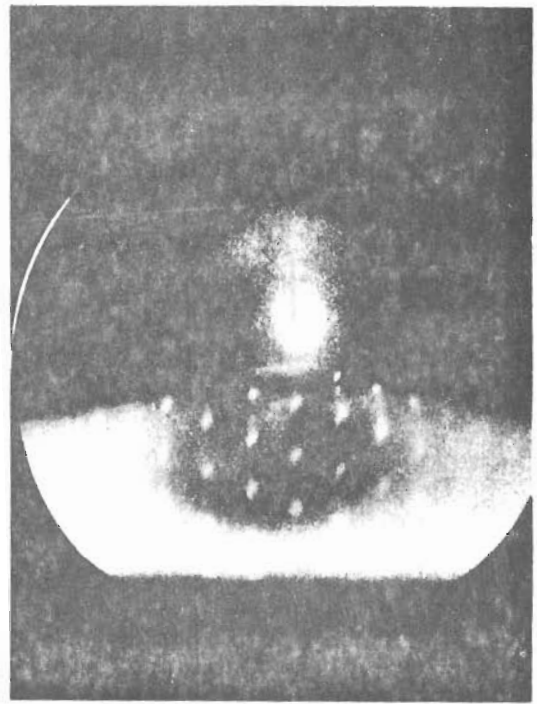


FIG. 2-4 TYPICAL GERMANIUM FILM SAMPLE ON CLEAVED CaF_2

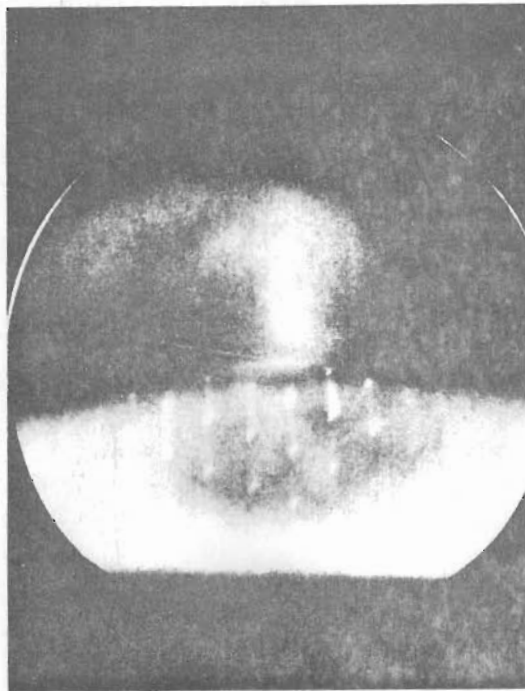
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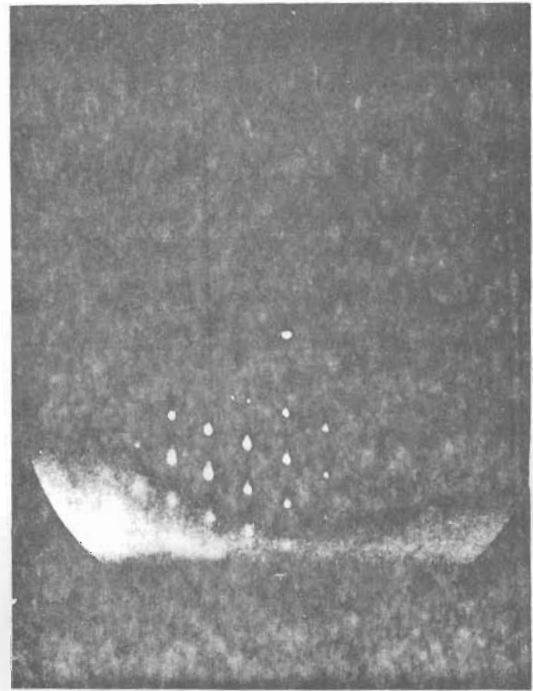
(a) Substrate Before Opening Shutter



(b) Pattern After 15 Seconds Growth



(c) 3 Minutes Growth



(d) 5 Minutes Growth

FIG. 2-6 TIME SEQUENCE REFLECTION ELECTRON DIFFRACTOGRAMS SHOWING EPITAXIAL GROWTH OF GERMANIUM FILM ON CaF_2

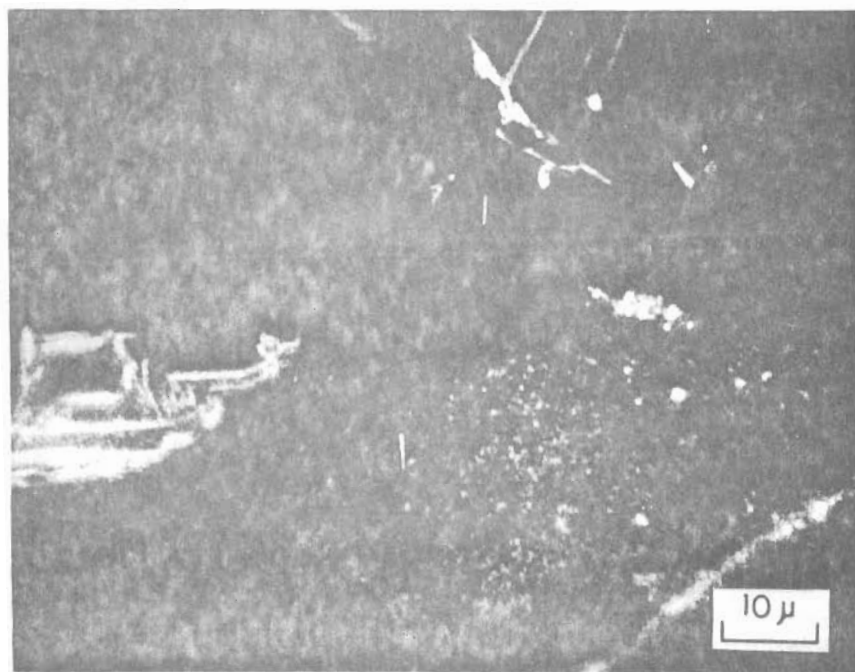


FIG. 2-7 SURFACE PHOTOMICROGRAPH OF
EPITAXIAL Ge FILM ON CLEAVED CaF₂

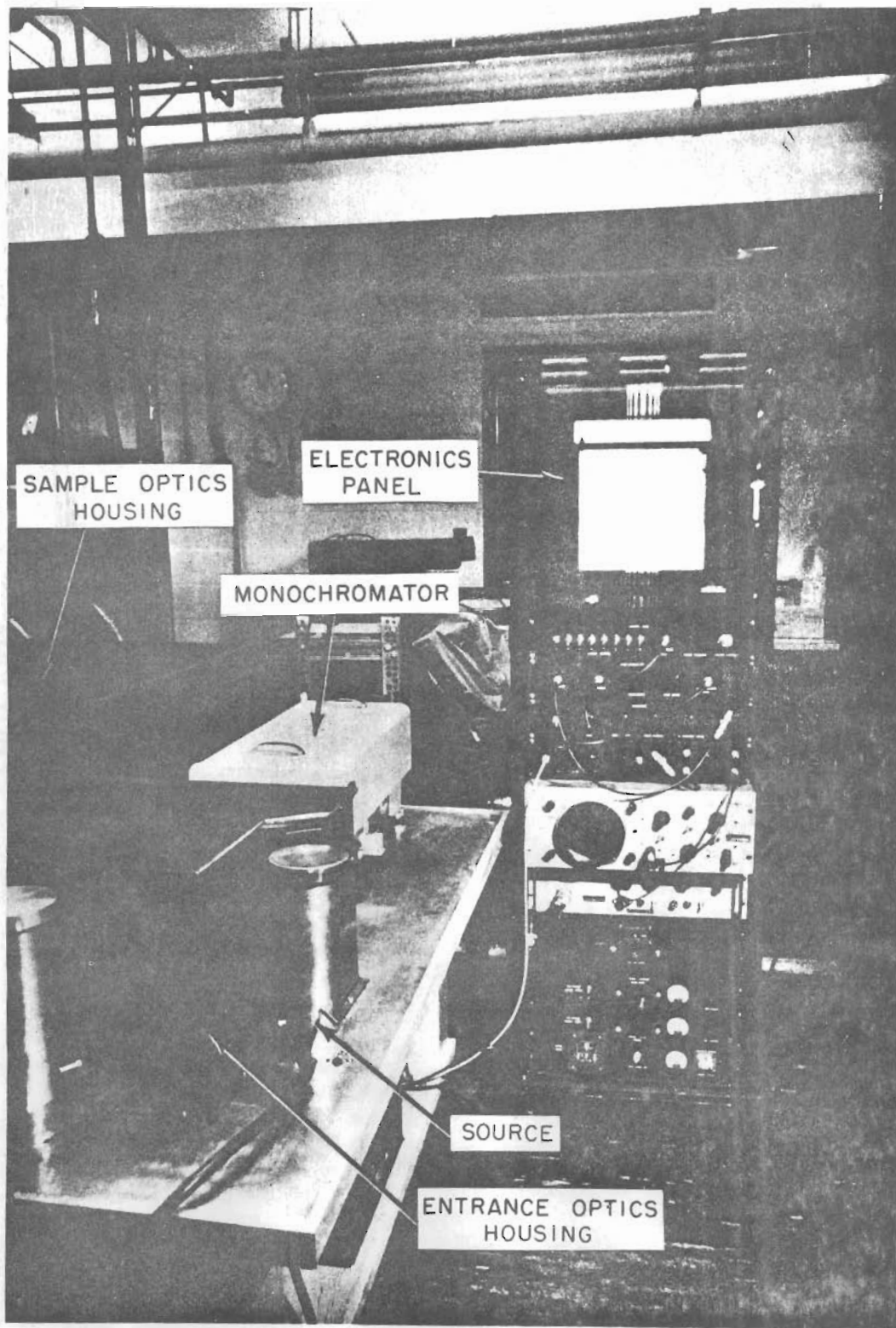


FIG. 4-2 PHOTOGRAPH OF THE SPECTROPHOTOMETER

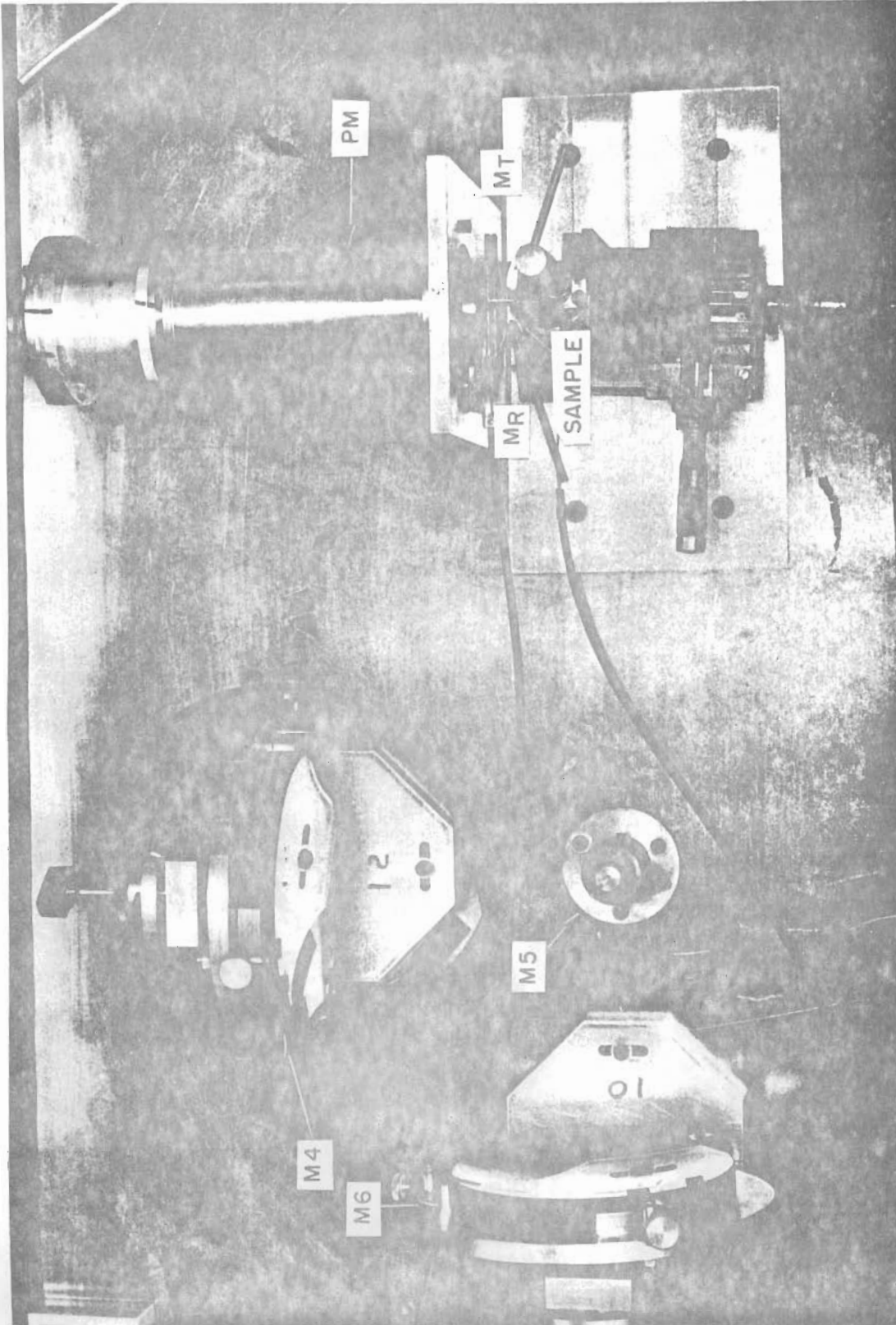
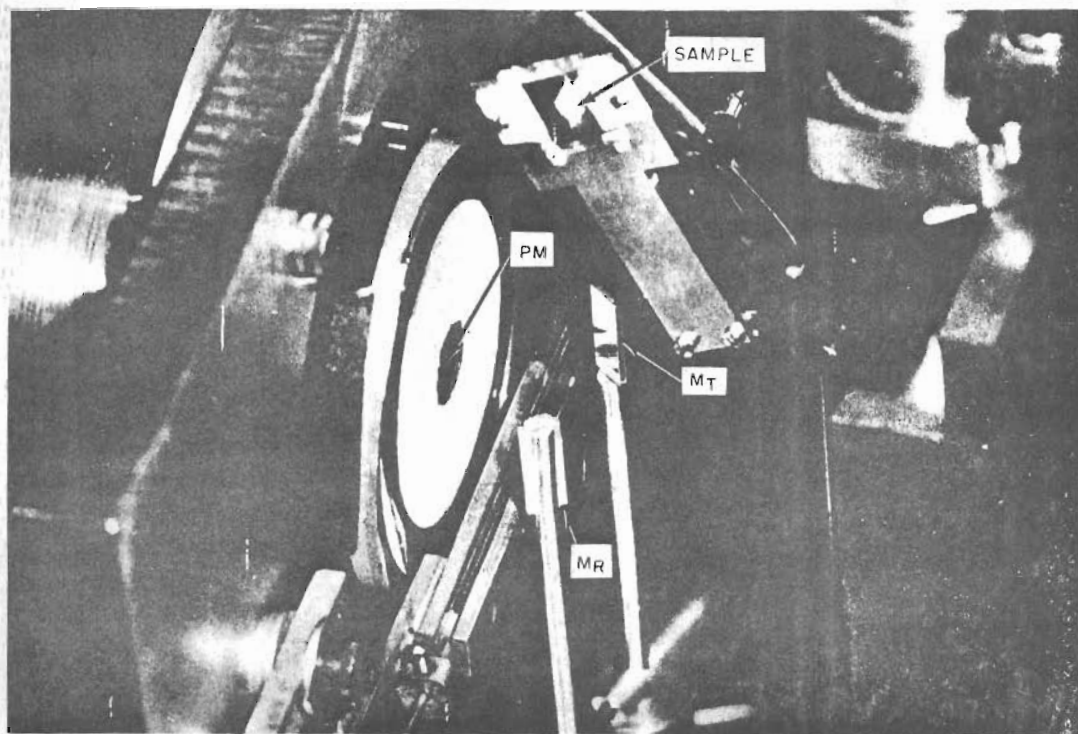
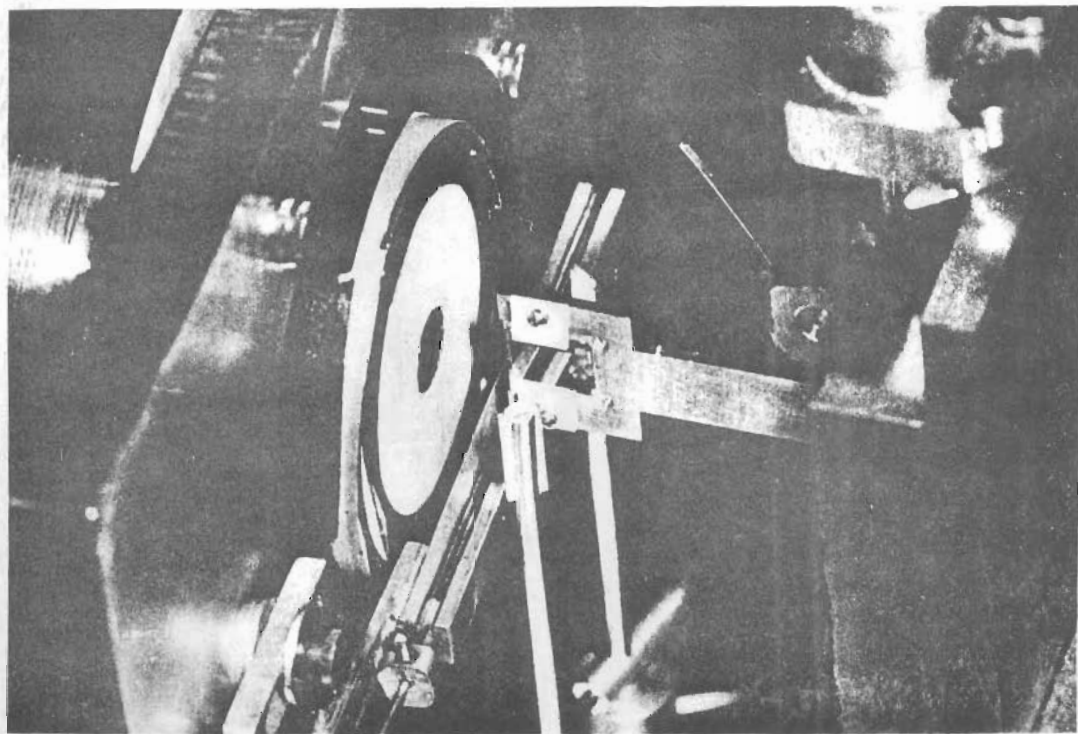


FIG. 4-3 PHOTOGRAPH OF SAMPLE OPTICS



(a) SAMPLE OUT

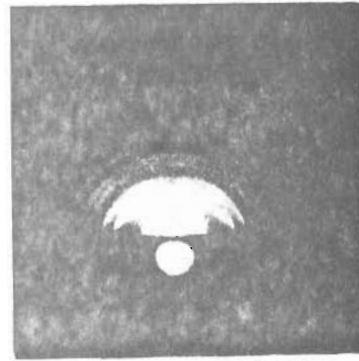


(b) SAMPLE IN

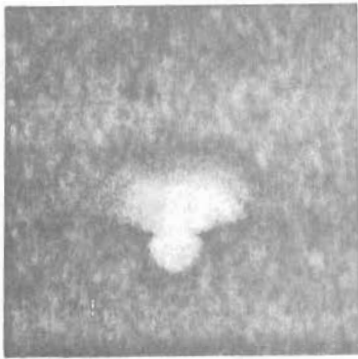
FIG. 4-4 DETAILS OF SAMPLE OPTICS



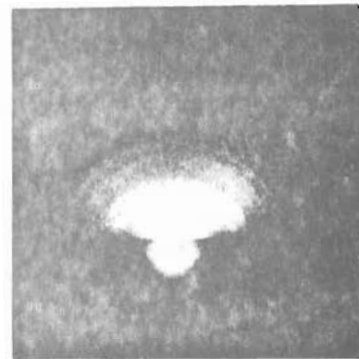
1. 780°C



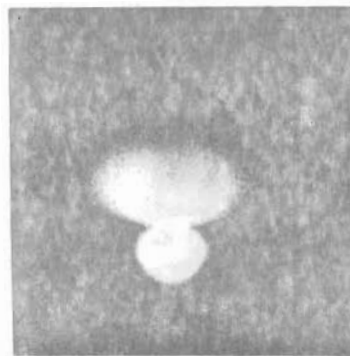
2. 600°C



3. 450°C



4. 300°C

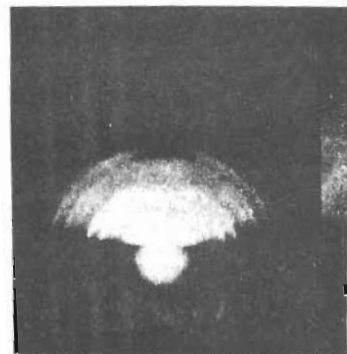


5. 25°C

FIG. 4-6 RED PATTERNS FOR Ge FILMS ON FUZED QUARTZ FOR VARIOUS SUBSTRATE TEMPERATURES, T_s . Δ APPROXIMATELY CONSTANT.



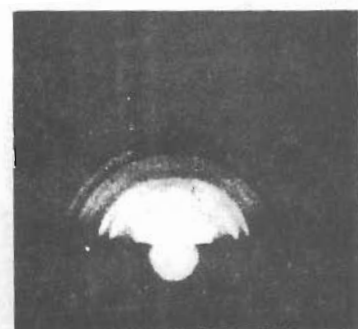
1. 3850Å/min



2. 1600Å/min

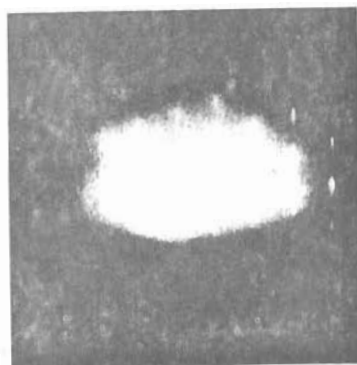


3. 670Å/min

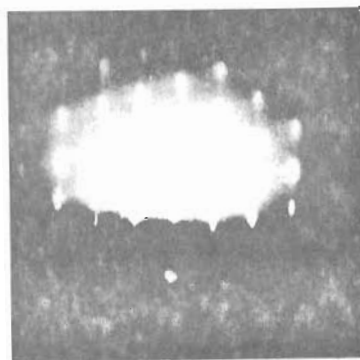


4. 154Å/min

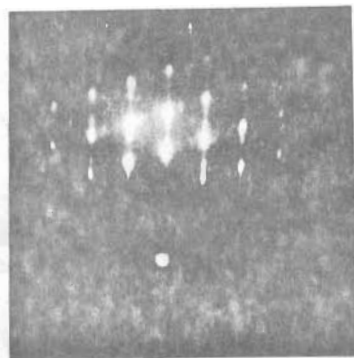
FIG. 4-8 RED PATTERNS FOR Ge FILMS ON FUZED QUARTZ FOR VARIOUS DEPOSITION RATES, Δ . $T_s = 600^\circ\text{C}$.



$T_s = 600^\circ\text{C}$
 $\Delta = 925 \text{ \AA}/\text{min}$
 $\alpha = 1850 \text{ \AA}$



$T_s = 600^\circ\text{C}$
 $\Delta = 750 \text{ \AA}/\text{min}$
 $\alpha = 250 \text{ \AA}$



$T_s = 620^\circ\text{C}$
 $\Delta = 810 \text{ \AA}/\text{min}$
 $\alpha = 135 \text{ \AA}$

FIG. 4--10 RED PATTERNS FOR Ge FILMS ON CaF₂.

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